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JAMA Dermatol. Author manuscript; available in PMC 2015 October 05.

Published in final edited form as:

JAMA Dermatol. 2014 May ; 150(5): 501–511. doi:10.1001/jamadermatol.2013.7124.

Indoor Tanning Among High School Students in the United States, 2009 and 2011

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Abstract

IMPORTANCE—Indoor tanning is associated with an increased risk of skin cancer, including melanoma, and is particularly dangerous for younger and more frequent indoor tanners.

OBJECTIVE—To examine the prevalence of indoor tanning and frequent indoor tanning (≥10 times during the 12 months before each survey) and their association with health-related behaviors.

DESIGN, SETTING, AND PARTICIPANTS—A cross-sectional study examined data from the 2009 and 2011 national Youth Risk Behavior Surveys, which used nationally representative samples of US high school students representing approximately 15.5 million students each survey year. The study included 25 861 students who answered the indoor tanning question.

MAIN OUTCOMES AND MEASURES—The prevalence of indoor tanning and frequent indoor tanning were examined as well as their association with demographic characteristics and health-related behaviors using multivariable logistic regression modeling.

RESULTS—The prevalence of indoor tanning was greater among female, older, and non-Hispanic white students. Indoor tanning was highest among female students aged 18 years or

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Conflict of Interest Disclosures: None reported.

Disclaimer: The findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Author Contributions: Dr Guy and Ms Berkowitz had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Guy, Berkowitz, Holman, Richardson.
Acquisition of data: Guy, Berkowitz.
Analysis and interpretation of data: Guy, Berkowitz, Tai, Everett Jones, Richardson.eb
Drafting of the manuscript: Guy, Everett Jones.
Critical revision of the manuscript for important intellectual content: Guy, Berkowitz, Tai, Holman, Richardson.
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older, with 31.5% engaging in indoor tanning in 2011, and among non-Hispanic white female students, with 29.3% engaging in indoor tanning in 2011. Among female students, the adjusted prevalence of indoor tanning decreased from 26.4% in 2009 to 20.7% in 2011. Among female and male students, indoor tanning was associated with other risk-taking behaviors, such as binge drinking ($P < .001$ and $P = .006$, respectively), unhealthy weight control practices ($P < .001$, for both), and having sexual intercourse ($P < .001$, for both). Additionally, indoor tanning among female students was associated with using illegal drugs ($P < .001$) and having sexual intercourse with 4 or more persons ($P = .03$); use among male students was associated with taking steroids without a physician's prescription ($P < .001$), smoking cigarettes daily ($P = .03$), and attempting suicide ($P = .006$). More than half of respondents engaging in indoor tanning reported frequent use of the devices.

CONCLUSIONS AND RELEVANCE—Indoor tanning is common among high school students. Public health efforts are needed to change social norms regarding tanned skin and to increase awareness, knowledge, and behaviors related to indoor tanning. The clustering of risky behaviors suggests a need for coordinated, multifaceted approaches, including primary care physician counseling, to address such behaviors among adolescents.

The incidence of nonmelanoma skin cancer, consisting primarily of basal cell and squamous cell carcinomas, has been increasing, with an estimated incidence of 3.5 million in 2006, a doubling since 1994.[1,2] The incidence of melanoma, one of the most commonly diagnosed cancers among adolescents, has been increasing 2% to 5% annually among non-Hispanic whites in the United States.[3–6] In addition to health effects, skin cancer poses a substantial economic burden. The annual direct medical cost of treatment was estimated at $1.7 billion in 2004.[7] Exposure to UV radiation, both from sunlight and indoor tanning devices, is among the most preventable known risk factors for skin cancer.[8] Indoor tanning is associated with an increased risk of skin cancer, and indoor tanning devices are considered carcinogenic to humans according to the World Health Organization.[9–14] Indoor tanning is particularly dangerous for younger users. Indoor tanning before age 35 years increases the risk of melanoma by 59%.[9] Frequent use further increases the risk,[9,12] with each additional indoor tanning session per year increasing melanoma risk by 1.8%.[9] Reducing the proportion of adolescents in grades 9 to 12 who use artificial sources of UV light for tanning is a Healthy People 2020[15] objective and an important strategy for reducing the burden of skin cancer.

Despite the health risks, indoor tanning is common among adolescents in the United States[16] and is associated with many health-related behaviors.[17–22] Using a nationally representative sample of US high school students, we examined the prevalence of indoor tanning and frequent indoor tanning (≥10 times during the 12 months before each survey) and the association between indoor tanning and other health-related behaviors. Understanding the prevalence of indoor tanning and its relationship with other health-related behaviors may be useful in designing risk-reduction interventions for skin cancer prevention.

Methods

The Youth Risk Behavior Surveillance System (YRBSS) was established by the Centers for Disease Control and Prevention to monitor the prevalence of behaviors influencing health.

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The national Youth Risk Behavior Survey (YRBS), a component of the YRBSS, uses a 3-stage cluster sample design to produce a representative sample of public and private high school students in grades 9 through 12. The national YRBS protocol was approved by the Centers for Disease Control and Prevention institutional review board. The YRBS is conducted in accordance with parental permission procedures in each locality; student participants receive no financial compensation. Students completed self-administered questionnaires during 1 class period, directly recording their responses. The overall response rates were 71% for both 2009 (February–May 2009) and 2011 (February–May 2011). Sample sizes were 16 410 in 2009 and 15 425 in 2011, representing approximately 15.5 million students nationally each survey year.

Beginning in 2009, the YRBS asked about indoor tanning. This analysis was restricted to the 25 861 students who answered the following question: “During the past 12 months, how many times did you use an indoor tanning device such as a sunlamp, sunbed, or tanning booth? (Do not include getting a spray-on tan.)” Response choices were 0 times, 1 or 2 times, 3 to 9 times, 10 to 19 times, 20 to 39 times, or 40 or more times. *Indoor tanning* was defined as having used an indoor tanning device 1 or more times during the 12 months before each survey. *Frequent indoor tanning* was defined as having used an indoor tanning device 10 or more times during the same period.[16,19,22] Respondent characteristics are presented in Table 1. Differences in demographic and health-related behaviors between students engaging in indoor tanning and those not engaging in indoor tanning were assessed using the χ^2 test. Given the differences in indoor tanning behavior among males and females,[16,17] we stratified our analyses by sex. We examined the prevalence of indoor tanning by age, race/ethnicity, and US census region, where prevalence has been shown to vary.[16,17] Our adjusted models controlled for health-related behaviors previously shown[17–22] to be associated with indoor tanning or that were a priori considered theoretically related to the outcome, specifically, routine sunscreen use, smoking cigarettes daily, binge drinking, using illegal drugs, taking steroids without a physician’s prescription, eating fruits and vegetables 5 or more times per day, unhealthy weight control practices, sexual behavior, attempted suicide, and playing on at least 1 sports team (Table 1). The inclusion of health-related behaviors across the YRBS priority risk categories allows for an examination of the potential clustering of indoor tanning with other health-related behaviors.

We calculated the unadjusted prevalence of indoor tanning and frequent indoor tanning along with their corresponding 95% CIs overall and by age, race/ethnicity, and US census region. We compared indoor tanning prevalence between subcategory levels with linear contrasts. For ease of interpretation, we calculated predictive margins (adjusted percentages) from the adjusted multivariable logistic regression models.[23] The predictive margin for a specific group represents the average predicted response if everyone had been in that group. We assessed overall associations of the adjusted percentages with the outcomes by using the adjusted Wald *F* statistic. Differences between categories within each adjusted variable were assessed with general linear contrast. To provide national estimates, weights based on student sex, race/ ethnicity, and grade were applied to adjust for school and student nonresponse and oversampling of black and Hispanic students.[24,25] A 2-sided value of $P < .05$ was considered statistically significant. Analyses were performed with SAS, version 9.3

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(SAS Institute, Inc) and SUDAAN, version 10.0.1 (RTI International) to account for the complex survey design.

Results

Demographic Characteristics and Health-Related Behaviors

Students engaging in indoor tanning were more likely to be female, older, and non-Hispanic white (Table 1). The prevalence of most health-related behaviors was higher among students engaging in indoor tanning than those not engaging in indoor tanning, including ever having smoked cigarettes daily, binge drinking, taking steroids without a physician's prescription, unhealthy weight control practices, ever having sexual intercourse, and having attempted suicide (all $P < .001$).

Prevalence of Indoor Tanning, 2009 and 2011

Overall, there were no significant differences in the unadjusted prevalence of indoor tanning among high school students between 2009 and 2011. In both years, female students had a significantly higher prevalence of indoor tanning than did male students ($P < .001$). Among female students, indoor tanning increased with age and was highest among non-Hispanic whites (Table 2).

Factors Associated With Indoor Tanning

In the adjusted model, indoor tanning among female students decreased from 26.4% in 2009 to 20.7% in 2011 ($P = .002$). Among females, indoor tanning was significantly higher among students aged 17 years or older than among those younger than 17 years ($P < .05$) and among non-Hispanic white students compared with other race/ethnicity groups ($P < .001$). The prevalence of indoor tanning varied by geographic region, from 17.4% in the West to 27.2% in the South ($P = .002$) (Table 3). Among female students, indoor tanning was positively associated with not routinely using sunscreen ($P < .001$), binge drinking ($P < .001$), using illegal drugs ($P < .001$), unhealthy weight control practices ($P < .001$), ever having sexual intercourse ($P < .001$), having sexual intercourse with 4 or more persons ($P = .03$), and playing on at least 1 sports team ($P < .001$) and was negatively associated with having attempted suicide ($P = .002$).

In the adjusted models among male high school students, the prevalence of indoor tanning was significantly higher among students aged 18 years or older than younger students ($P = .003$) and among non-Hispanic white students compared with non-Hispanic black or Hispanic students ($P < .001$) (Table 3). Indoor tanning was positively associated with ever having smoked cigarettes daily ($P = .03$), binge drinking ($P = .006$), taking steroids without a physician's prescription ($P < .001$), eating fruits and vegetables 5 or more times per day ($P = .02$), unhealthy weight control practices ($P < .001$), ever having sexual intercourse ($P < .001$), having attempted suicide ($P = .006$), and playing on at least 1 sports team ($P = .01$).

Prevalence of Frequent Indoor Tanning, 2009 and 2011

Among female and male high school students engaging in indoor tanning, no statistically significant changes were observed in the unadjusted prevalence of frequent use from 2009 to

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2011 (Table 4). In 2009 and 2011, female students were more likely to engage in frequent indoor tanning than were male students ($P = .008$ and $P < .001$, respectively). Among females, the highest prevalence of frequent use was found among those aged 18 years or older and among non-Hispanic whites.

Factors Associated With Frequent Indoor Tanning

In the adjusted model, female students who engaged infrequent indoor tanning were more likely to be aged 17 years or older ($P < .001$) and more likely to be non-Hispanic white than other race/ethnicity groups ($P < .001$). Among female students, frequent indoor tanning was positively associated with not routinely using sunscreen ($P = .01$), engaging in binge drinking ($P < .001$), takin g steroids without a physician's prescription ($P = .04$), and ever having sexual inter course ($P = .001$)(Table 5).

In the adjusted model, frequent indoor tanning was not associated with age or race/ethnicity among male students. Frequent indoor tanning was positively associated with having sexual intercourse with 4 or more persons ($P = .002$) and having attempted suicide ($P = .03$).

Discussion

Our findings indicate that indoor tanning is common among US high school students, with 13.3% engaging in this activity in 2011. The prevalence of indoor tanning was greater among female, older, and non-Hispanic white students, with the highest prevalence among females aged 18 years or older (31.5% in 2011) and among non-Hispanic white females (29.3% in 2011). Among students who engaged in indoor tanning, frequent sessions were common, with more than half reporting frequent use (≥10 times during the 12 months before each survey). Indoor tanning was associated with many risky health-related behaviors, such as smoking cigarettes, binge drinking, illegal drug use, and sexual behaviors linked to unintentional pregnancy and sexually transmitted diseases. Additionally, indoor tanning was associated with a subset of health-related behaviors linked to appearance with potentially positive health effects, such as playing on a sports team and eating fruits and vegetables, and with potentially negative health effects, such as unhealthy weight control practices and taking steroids without a physician's prescription.

The clustering of risky health-related behaviors observed in this study may reflect adolescents' vulnerability and, in turn, a tendency to engage in risky behaviors that are associated with certain psychological characteristics, such as low self-esteem, sensation seeking, or depression.[26] Alternatively, these associations may reflect the emergence of risky health-related behaviors that often occur during adolescence.[27–29] Interventions designed to influence underlying factors, such as self-esteem, body-image, and normative beliefs, may be promising strategies for addressing multiple health-related behaviors more effectively among youth. Given the potential for these behaviors to continue into adulthood, early intervention is key to preventing initiation and promoting cessation of indoor tanning. Additionally, our results, along with previous findings,[19–21] indicate that appearance motivations likely play a role in indoor tanning. Thus, efforts to reduce indoor tanning may be more successful if they address appearance-based motives and emphasize the detrimental

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appearance aspects of indoor tanning rather than solely focusing on the negative health effects.

Some differences were observed in the factors associated with indoor tanning and frequent indoor tanning. For example, among females, smoking cigarettes was associated with indoor tanning but not with frequent indoor tanning, and steroid use was associated only with frequent indoor tanning. These findings suggest that the motivations for indoor tanning may vary among different types of indoor tanners. More research is needed to understand these different motivations, which could aid in designing and implementing interventions to reduce indoor tanning.

Attempted suicide was positively associated with indoor tanning among male students and negatively associated with indoor tanning among female students. Our findings are similar to those of previous research[30] that found a positive association between mental health disorders, such as anxiety and obsessive-compulsive disorder, and indoor tanning among young males but not among females. Previous research[31] has also shown a relationship between indoor tanning among males with body dissatisfaction issues, especially those who had been bullied. More research is needed to examine the relationship between attempted suicide and indoor tanning.

Among female students, the adjusted prevalence of indoor tanning decreased from 26.4% in 2009 to 20.7% in 2011. This decrease may be partially attributable to the recent increase in laws addressing minors' access to indoor tanning through age restrictions or requiring parental accompaniment and/or consent.[32,33] Although previous studies[34,35] have found parental accompaniment/consent laws to be ineffective, some evidence[36] suggests that age restrictions may reduce access among minors. If effective, such efforts could not only reduce indoor tanning but also reduce melanoma cases and associated health care costs.[37]

Another possible explanation for the reduction in indoor tanning among female students is the implementation of a 10% excise tax on indoor tanning services under the Affordable Care Act in July 2010.[38] If a similar price sensitivity exists as with tobacco excise taxes,[39] the tax may reduce indoor tanning and UV radiation exposure, especially among adolescents.[40,41] Although early evidence suggests that demand for indoor tanning may be somewhat inelastic, 26% of tanning salons in Illinois reported fewer clients after implementation of the tax.[42]

Despite reductions in indoor tanning among female students, the practice remains common among high school students. Additional approaches to reducing indoor tanning include the US Food and Drug Administration's[43] proposed reclassification of indoor tanning devices from low-risk to moderate-risk devices requiring premarket notification and labels designed to warn young people not to use them. Additionally, deceptive health and safety claims about indoor tanning should be monitored. A recent report[44] found that only 7% of salons reported any harmful effects of indoor tanning and 78% reported health benefits.

The association between indoor tanning and other health-related behaviors reinforces the need for coordinated multifaceted approaches to address these problems among adolescents. Incorporating indoor tanning messages into comprehensive prevention messages could

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complement skin cancer–specific prevention efforts. In addition, preventing exposure to indoor tanning through health behavior counseling is a key cancer prevention opportunity for physicians.[45] Evidence from a US Preventive Services Task Force review[46] suggests that behavioral counseling by a primary care physician can reduce UV exposure, including indoor tanning, among fair-skinned persons aged 10 to 24 years. Among young women, appearance-focused behavioral interventions stressing the aging effect of UV radiation on the skin using self-guided booklets, videos on photoaging, and sessions with a peer counselor reduced indoor tanning by up to 35%.[46–48] Because physicians are often asked about indoor tanning,[49] efforts are needed to develop and disseminate effective user-friendly tools to aid in patient communication. Additionally, because context-changing interventions are generally the most effective public health actions,[50] strategies are needed to engage adolescents in changing the social norms related to tanned skin and attractiveness.

This study is subject to certain limitations. First, the results are based on youths who attended high school and may not represent all persons in this age group. Second, indoor tanning was self-reported, and the degree of misreporting cannot be determined. Although reliability data are not available for the indoor tanning question, there is evidence of good test-retest reliability on many other YRBS questions.[51] Third, the data do not permit a causal inference or temporal ordering between behaviors and indoor tanning. Fourth, the YRBS does not examine psychosocial factors that have been shown to be predictors of indoor tanning.[52] Finally, the current sampling design of the national YRBS does not allow for state-level estimates.

Conclusions

Indoor tanning and frequent indoor tanning are common among high school students in the United States and are part of a cluster of potentially risky behaviors. Given this clustering, coordinated multifaceted interventions using both novel and tested prevention strategies may be necessary to include in comprehensive skin cancer efforts addressing these risky behaviors. This information can inform health care providers and, through their patient counseling, could lead to improved adolescent health. In addition, parents, educators, and policymakers can use this information to enhance initiatives aimed at reducing indoor tanning among adolescents. Continued surveillance of indoor tanning and further investigation into the specific motivations of those engaging in indoor tanning can aid in developing risk-reduction strategies for skin cancer prevention.

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Table 1

Demographic Characteristics and Health-Related Behaviors of US High School Students—National Youth Risk Behavior Survey, 2009 and 2011

Characteristic	% (95% CI)			*P* Value[b]
	All Students (N = 25 861)	Engaged in Indoor Tanning[a] (n = 3284)	Did Not Engage in Indoor Tanning (n = 22 577)	
Sex				
Female	49.7 (46.1–49.8)	76.9 (74.6–79.0)	43.0 (41.0–45.1)	<.001
Male	52.1 (50.2–53.9)	23.1 (21.0–25.4)	57.0 (54.9–59.0)	
Age, y				
≤14	11.5 (10.5–12.7)	7.1 (6.2–8.1)	12.3 (11.1–13.5)	<.001
15	24.6 (23.6–25.7)	17.7 (16.2–19.5)	25.8 (24.7–26.9)	
16	26.1 (25.3–27.0)	25.6 (23.8–27.5)	26.2 (25.2–27.1)	
17	24.2 (23.2–25.2)	30.4 (28.3–32.5)	23.1 (22.2–24.1)	
≥18	13.6 (12.7–14.6)	19.2 (17.5–20.9)	12.6 (11.7–13.6)	
Race/ethnicity				
Non-Hispanic white	61.9 (57.6–66.0)	82.3 (79.5–84.8)	58.4 (53.8–62.9)	<.001
Non-Hispanic black	13.0 (10.7–15.8)	3.8 (2.7–5.3)	14.6 (12.0–17.7)	
Hispanic	17.2 (14.7–20.0)	9.4 (7.8–11.2)	18.5 (15.9–21.6)	
Non-Hispanic other	7.9 (6.5–9.6)	4.6 (3.6–5.7)	8.5 (6.9–10.3)	
US census region				
Northeast	18.0 (10.6–29.1)	19.8 (10.9–33.2)	17.7 (10.4–28.7)	<.001
Midwest	27.1 (17.9–38.8)	32.5 (21.0–46.5)	26.2 (17.2–37.7)	
South	33.3 (24.1–43.9)	34.8 (23.8–47.8)	33.0 (24.0–43.5)	
West	21.6 (14.9–30.2)	12.9 (7.4–21.6)	23.1 (16.1–32.0)	
Health-related behaviors				
Routine sunscreen use[c]	10.1 (9.3–10.8)	9.7 (8.2–11.5)	10.1 (9.3–11.0)	.71
Ever smoked cigarettes daily[d]	11.0 (10.1–11.9)	22.7 (20.6–25.0)	9.0 (8.2–9.9)	<.001
Binge drinking[e]	23.7 (22.6–24.8)	45.0 (42.5–47.5)	20.1 (19.0–21.2)	<.001
Ever used illegal drugs[f]	39.4 (37.7–41.1)	57.8 (54.6–61.0)	36.2 (34.4–38.1)	<.001
Ever took steroids without a physician's prescription[g]	3.4 (3.0–3.8)	9.3 (8.0–10.8)	2.4 (2.1–2.7)	<.001
Ate fruit and vegetables ≥5 times/d[h]	22.9 (21.9–23.8)	24.4 (22.1–26.8)	22.6 (21.7–23.5)	.10
Unhealthy weight control practices[i]	15.2 (14.3–16.1)	30.6 (28.5–32.7)	12.5 (11.7–13.4)	<.001
Ever had sexual intercourse	46.5 (44.2–48.7)	69.3 (67.1–71.4)	42.6 (40.2–45.0)	<.001
Had sexual intercourse with ≥4 persons during their life	14.4 (13.4–15.5)	24.7 (22.3–27.3)	12.7 (11.6–13.8)	<.001
Attempted suicide[j]	6.8 (6.3–7.3)	11.3 (9.8–12.9)	6.0 (5.5–6.5)	<.001
Played on ≥1 sports team[k]	59.1 (57.0–61.1)	63.1 (60.3–65.8)	58.4 (56.2–60.5)	<.001

[a] Indoor tanning was defined as using an indoor tanning device (eg, a sunlamp, sunbed, or tanning booth) 1 or more times during the 12 months before the survey; it did not include getting a spray-on tan. Estimates were based on weighted data.

[b] Differences between students engaging in indoor tanning and those not engaging in indoor tanning for each variable were assessed with the χ^2 test.

[c] Most of the time or always wore sunscreen with a sun protection factor of 15 or higher when outside for more than 1 hour on a sunny day.

[d] Ever smoked 1 or more cigarettes every day for 30 days.

[e] Had 5 or more drinks of alcohol in a row within a couple of hours on 1 or more days during the 30 days before the survey.

[f] Used marijuana, cocaine, heroin, methamphetamines, ecstasy, or injected any illegal drug with a needle 1 or more times during their life.

[g] Took steroid pills or injections without a physician's prescription 1 or more times during their life.

[h] Consumed 100% fruit juice, fruit, green salad, potatoes (excluding French fries, fried potatoes, or potato chips), carrots, or other vegetables during the 7 days before the survey.

[i] Took diet pills, powders, or liquids; vomited or took laxatives; or did not eat for 24 hours or more to lose weight or keep from gaining weight during the 30 days before the survey.

[j] Attempted 1 or more times during the 12 months before the survey.

[k] Sport was run by their school or community groups during the 12 months before the survey.

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Table 2

Indoor Tanning Among US High School Students—National Youth Risk Behavior Survey, 2009 and 2011[a]

	% (95% CI)					
	Total		Female		Male	
Characteristic	**2009 (N = 14 590)**	**2011 (N = 11 271)**	**2009 (n = 7314)**	**2011 (n = 5600)**	**2009 (n = 7214)**	**2011 (n = 5625)**
Total	15.6 (13.7–17.6)	13.3 (11.2–15.7)	25.4 (22.4–28.6)	20.9 (17.6–24.7)	6.7 (5.6–8.0)	6.2 (4.8–7.8)
Age, y						
≤14	9.7 (7.7–12.2)	8.1 (6.2–10.5)	14.5 (11.3–18.3)	11.2 (7.8–15.9)	4.8 (3.1–7.4)	4.2 (2.7–6.5)
15	12.0 (10.1–14.1)[b]	8.7 (7.0–10.8)[b]	19.0 (16.1–22.2)[b]	12.7 (10.0–16.1)[b]	5.7 (4.5–7.3)	5.0 (3.5–6.9)
16	14.9 (12.7–17.4)[c]	13.6 (11.0–16.6)[c]	26.3 (22.4–30.6)[c]	22.1(17.9–27.0)[c]	5.0 (3.7–6.8)	5.6 (4.0–7.8)
17	19.1 (16.8–21.7)[d]	17.3 (13.9–21.2)[d]	31.6 (27.2–36.3)[d]	27.9 (23.0–33.5)[d]	7.0 (5.5–8.8)	7.2 (4.9–10.4)
≥18	22.0 (19.0–25.4)[e]	18.7 (15.7–22.1)[d]	34.0 (29.5–38.8)[d]	31.5 (25.7–38.1)[d]	12.4 (9.7–15.7)[e]	8.7 (6.0–12.4)[c]
Race/ethnicity						
Non-Hispanic white	21.1 (18.3–24.2)[f]	17.4 (14.5–20.6)[f]	37.4 (33.6–41.4)[f]	29.3 (25.1–33.9)[f]	7.0 (5.7–8.7)	6.2 (4.4–8.8)
Non-Hispanic black	4.5 (3.1–6.4)	3.9 (2.6–5.7)	2.7 (1.7–4.1)	3.3 (2.0–5.3)	6.1 (4.1–9.0)	4.5 (2.8–7.1)
Hispanic	8.2 (6.9–9.7)	7.6 (6.1–9.6)	10.5 (8.8–12.6)	9.6 (7.1–12.8)	5.8 (4.4–7.6)	5.7 (4.2–7.7)
Non-Hispanic other	7.9 (5.2–11.7)	9.0 (7.0–11.5)	10.3 (6.2–16.7)	9.8 (7.0–13.6)	5.3 (3.2–8.6)	8.2 (5.7–11.7)
US census region						
Northeast	17.4 (12.7–23.4)[g]	12.8 (8.1–19.6)	28.4 (20.3–38.1)[g]	20.1 (12.6–30.5)	7.0 (4.1–11.8)	4.7 (3.1–7.3)
Midwest	18.6 (15.1–22.6)[g]	16.4 (12.8–20.7)[g]	33.3 (30.3–36.4)[g]	25.7 (20.7–31.3)[g]	7.4 (5.6–9.6)	8.0 (5.1–12.3)
South	17.0 (13.5–21.2)[g]	13.2 (8.9–19.0)	27.4 (21.7–33.9)[g]	20.9 (13.7–30.5)	7.3 (5.6–9.4)	5.6 (3.9–8.0)

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	% (95% CI)					
	Total		Female		Male	
Characteristic	2009 (N = 14 590)	2011 (N = 11 271)	2009 (n = 7314)	2011 (n = 5600)	2009 (n = 7214)	2011 (n = 5625)
West	8.1 (4.5–14.2)	9.3 (5.9–14.4)	11.7 (6.0–21.4)	14.4 (8.6–23.2)	4.7 (3.0–7.1)	5.1 (3.3–8.0)

[a] Indoor tanning was defined as using an indoor tanning device (eg, a sunlamp, sunbed, or tanning booth) 1 or more times during the 12 months before the survey; it did not include getting a spray-on tan. Estimates were based on weighted data. Because of missing data on sex, the sample sizes may not add to the total. No statistically significant differences in the unadjusted prevalence of indoor tanning device use among female and male high school students were observed between 2009 and 2011.

[b] $P < .05$ compared with age 14 years or younger, assessed with general linear contrast.

[c] $P < .05$ compared with age 15 years and 14 years or younger, assessed with general linear contrast.

[d] $P < .05$ compared with age 16 years, age 15 years, and age 14 years or younger, assessed with general linear contrast.

[e] $P < .05$ compared with age 17 years, age 16 years, age 15 years, and age 14 years or younger, assessed with general linear contrast.

[f] $P < .05$ compared with all other race/ethnicity groups, assessed with general linear contrast.

[g] $P < .05$ compared with the West region, assessed with general linear contrast.

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Table 3

Adjusted Prcentages of Indoor Tanning Among US High School Students—National Youth Risk Behavior Survey, 2009 and 2011[a]

	Female (n = 10 630)		Male (n = 9979)	
Characteristic	**Adjusted % (95% CI)[b]**	***P* Value**	**Adjusted % (95% CI)[b]**	***P* Value**
Total	23.8 (21.4–26.4)		5.2 (4.3–6.1)	
Year				
2009	26.4 (23.6–29.5)	.002	5.5 (4.7–6.6)	.33
2011	20.7 (17.8–23.9)		4.7 (3.5–6.4)	
Age, y				
≤14	17.6 (14.4–21.2)	<.001	3.4 (2.3–5.0)	.003
15	19.0 (16.5–21.8)		4.7 (3.6–6.1)	
16	24.4 (21.4–27.6)[c]		4.4 (3.4–5.8)	
17	27.3 (24.3–30.6)[d]		5.1 (4.0–6.5)[e]	
≥18	28.4 (25.0–32.2)[d]		7.6 (6.1–9.6)[f]	
Race/ethnicity				
Non-Hispanic white	32.3 (29.2–35.5)[g]	<.001	6.0 (4.9–7.2)[h]	<.001
Non-Hispanic black	2.0 (1.3–3.1)		2.2 (1.5–3.2)	
Hispanic	11.1 (9.1–13.4)		3.9 (2.9–5.1)	
Non-Hispanic other	13.4 (10.3–17.3)		5.0 (3.4–7.4)	
US census region				
Northeast	20.3 (16.6–24.6)	.002	4.0 (2.9–5.4)	.04
Midwest	26.8 (23.9–30.0)[i]		6.7 (5.0–8.8)[i]	
South	27.2 (23.2–31.6)[j]		5.2 (4.1–6.6)	
West	17.4 (12.9–23.1)		3.9 (2.7–5.6)	
Routine sunscreen use[k]				
Yes	16.6 (13.7–20.0)	<.001	5.8 (4.1–8.3)	.46
No	24.9 (22.3–27.8)		5.1 (4.3–6.1)	
Ever smoked cigarettes daily[l]				

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Characteristic	Female (n = 10 630)		Male (n = 9979)	
	Adjusted % (95% CI)[b]	*P* Value	Adjusted % (95% CI)[b]	*P* Value
Yes	23.7 (20.8–26.8)	.92	6.3 (5.0–7.9)	.03
No	23.8 (21.3–26.5)		4.8 (4.0–5.9)	
Binge drinking[m]				
Yes	31.2 (27.2–35.4)	<.001	6.2 (4.9–7.8)	.006
No	21.0 (18.8–23.3)		4.4 (3.7–5.3)	
Ever used illegal drugs[n]				
Yes	28.4 (25.5–31.5)	<.001	5.4 (4.3–6.8)	.41
No	20.7 (17.9–23.7)		4.8 (3.8–6.0)	
Ever took steroids without a physician's prescription[o]				
Yes	26.9 (21.5–33.0)	.21	12.0 (8.9–15.9)	<.001
No	23.7 (21.3–26.3)		4.7 (3.9–5.6)	
Ate fruit and vegetables ≥5 times/d[p]				
Yes	22.8 (19.8–26.1)	.27	6.3 (5.0–7.9)	.02
No	24.0 (21.7–26.6)		4.8 (3.9–5.8)	
Unhealthy weight control practices[q]				
Yes	27.8 (24.9–30.8)	<.001	9.3 (7.5–11.6)	<.001
No	22.7 (20.2–25.3)		4.5 (3.8–5.4)	
Ever had sexual intercourse				
Yes	29.6 (26.5–33.0)	<.001	6.5 (5.4–7.8)	<.001
No	18.2 (16.0–20.7)		3.4 (2.6–4.3)	
Had sexual intercourse with ≥4 persons during their life				
Yes	26.6 (23.2–30.4)	.03	5.8 (4.5–7.4)	.28
No	23.3 (20.9–26.0)		4.9 (4.0–6.0)	
Attempted suicide[r]				
Yes	19.5 (16.5–22.8)	.002	7.7 (5.7–10.2)	.006
No	24.2 (21.8–26.9)		4.9 (4.1–5.9)	

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Characteristic	Female (n = 10 630)		Male (n = 9979)	
	Adjusted % (95% CI)[b]	*P* Value	Adjusted % (95% CI)[b]	*P* Value
Played on ≥1 sports team[s]				
Yes	27.1 (24.2–30.3)	<.001	5.7 (4.8–6.7)	.01
No	19.8 (17.7–22.1)		4.2 (3.2–5.5)	

[a] Indoor tanning was defined as using an indoor tanning device (eg, a sunlamp, sunbed, or tanning booth) 1 or more times during the 12 months before the survey; it did not include getting a spray-on tan. Estimates were based on weighted data. Because of missing data, the sample size for each logistic regression analysis varies.

[b] Predictive margins calculated from multivariable logistic regression model including all covariates shown. *P* value was based on a global adjusted Wald *F* test for association between each of the variables and the outcome, controlling for all other variables in the logistic regression model.

[c] $P < .05$ compared with age 15 years and age 14 years or younger, assessed with general linear contrast.

[d] $P < .05$ compared with age 16 years, age 15 years, and age 14 years or younger, assessed with general linear contrast.

[e] $P < .05$ compared with age 14 years or younger, assessed with general linear contrast.

[f] $P < .05$ compared with age 17 years, age 16 years, age 15 years, and age 14 years or younger, assessed with general linear contrast.

[g] $P < .05$ compared with all other race/ethnicity groups, assessed with general linear contrast.

[h] $P < .05$ compared with non-Hispanic black and Hispanic, assessed with general linear contrast.

[i] $P < .05$ compared with the West, assessed with general linear contrast.

[j] $P < .05$ compared with the West and Northeast, assessed with general linear contrast.

[k] Most of the time or always wore sunscreen with a sun protection factor of 15 or higher when outside for more than 1 hour on a sunny day.

[l] Ever smoked 1 or more cigarettes every day for 30 days.

[m] Had 5 drinks or more of alcohol in a row within a couple of hours on 1 or more days during the 30 days before the survey.

[n] Used marijuana, cocaine, heroin, methamphetamines, ecstasy, or injected any illegal drug with a needle 1 or more times during their life.

[o] Took steroid pills or injections without a physician's prescription 1 or more times during their life.

[p] Consumed 100% fruit juice, fruit, green salad, potatoes (excluding French fries, fried potatoes, or potato chips), carrots, or other vegetables during the 7 days before the survey.

[q] Took diet pills, powders, or liquids; vomited or took laxatives; or did not eat for 24 hours or more to lose weight or keep from gaining weight during the 30 days before the survey.

[r] Attempted 1 or more times during the 12 months before the survey.

[s] Sport was run by their school or community groups during the 12 months before the survey.

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Table 4

Frequent Indoor Tanning Among US High School Students—National Youth Risk Behavior Survey, 2009 and 2011[a]

	% (95% CI)					
	Total		Female		Male	
Characteristic	2009 (N = 2026)	2011 (N = 1258)	2009 (n = 1517)	2011 (n = 930)	2009 (n = 500)	2011 (n = 324)
Total	49.1 (45.6–52.6)	51.1 (46.2–55.9)	51.7 (47.6–55.7)	54.3 (48.7–59.7)	40.1 (32.7–48.0)	40.6 (34.1–47.6)
Age, y						
≤14	48.0 (39.4–56.7)	41.7 (28.2–56.6)	45.4 (36.4–54.8)	42.4 (25.9–60.8)	55.2 (38.7–70.7)	36.4 (16.8–61.8)
15	42.1 (36.9–47.4)	44.7 (37.0–52.6)	43.4 (36.6–50.4)	47.6 (37.6–57.8)	38.2 (25.0–53.4)	37.6 (27.8–48.5)
16	46.4 (40.6–52.2)	47.7 (41.3–54.1)	46.0 (40.1–52.0)	49.4 (41.1–57.8)	48.1 (33.2–63.3)	41.1 (27.6–56.1)
17	55.1 (50.1–60.1)[b]	56.0 (48.9–62.7)[b]	59.0 (53.0–64.7)[c]	59.2 (51.5–66.3)[c]	38.6 (29.0–49.0)	44.1 (29.0–60.3)
≥18	50.6 (43.9–57.3)[d]	56.4 (47.1–65.3)[d]	58.6 (50.8–66.1)[c]	63.1 (51.8–73.2)[c]	32.4 (21.0–46.5)[e]	37.1 (25.0–51.1)
Race/ethnicity						
Non-Hispanic white	51.0 (47.4–54.5)[f]	53.6 (48.6–58.6)[g]	54.6 (50.4–58.6)[h]	57.0 (51.1–62.8)[h]	34.3 (27.1–42.3)[i]	38.6 (30.4–47.5)
Non-Hispanic black	47.2 (37.3–57.4)	37.2 (23.8–52.9)	23.7 (10.9–44.1)	33.4 (14.3–60.1)	57.6 (48.1–66.6)	40.1 (23.8–59.0)
Hispanic	34.6 (28.0–41.9)	37.8 (28.3–48.3)	31.1 (22.9–40.7)	36.4 (26.4–47.8)	40.6 (30.8–51.2)	39.0 (26.1–53.6)
Non-Hispanic other	50.3 (38.0–62.6)	45.6 (33.2–58.5)	40.1 (27.7–53.9)	41.9 (25.7–60.2)	71.8 (51.1–86.2)	49.7 (32.3–67.1)
US census region						
Northeast	51.2 (43.8–58.5)	54.7 (43.4–65.6)	50.8 (42.7–58.8)	57.7 (42.8–71.3)	52.2 (31.2–72.4)	40.5 (25.7–57.4)
Midwest	45.4 (39.5–51.4)	51.8 (44.5–59.1)	48.9 (42.4–55.3)	56.3 (48.2–64.1)	33.7 (22.0–47.7)	38.4 (27.5–50.7)
South	51.7 (47.0–56.3)	56.9 (49.4–64.0)	56.4 (50.1–62.5)	59.5 (51.4–67.2)	34.8 (29.3–40.7)	47.2 (37.4–57.2)
West	45.4 (35.4–55.8)	34.0 (25.7–43.4)[j]	44.9 (31.0–59.8)	32.9 (24.3–42.9)	46.3 (35.6–57.4)	35.4 (24.2–48.5)

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[a] Frequent indoor tanning was defined as using an indoor tanning device (eg, a sunlamp, sunbed, or tanning booth) 10 or more times during the 12 months before the survey among those engaging in indoor tanning in the past 12 months; it did not include getting a spray-on tan. Estimates were based on weighted data. Because of missing data on sex, the sample sizes may not add to the total. No statistically significant differences in the unadjusted prevalence of frequent indoor tanning among female and male high school students were observed between 2009 and 2011.

[b] $P < .05$ compared with age 16 years and age 15 years, assessed with general linear contrast.

[c] $P < .05$ compared with age 16 years, age 15 years, and age 14 years or younger, assessed with general linear contrast.

[d] $P < .05$ compared with age 15 years, assessed with general linear contrast.

[e] $P < .05$ compared with age 14 years or younger, assessed with general linear contrast.

[f] $P < .05$ compared with Hispanic, assessed with general linear contrast.

[g] $P < .05$ compared with non-Hispanic black and Hispanic, assessed with general linear contrast.

[h] $P < .05$ compared with all other race/ethnicity groups, assessed with general linear contrast.

[i] $P < .05$ compared with non-Hispanic black and non-Hispanic other, assessed with general linear contrast.

[j] $P < .05$ compared with all other US census regions, assessed with general linear contrast.

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Table 5

Adjusted Percentages of Frequent Indoor Tanning Among US High School Students—National Youth Risk Behavior Survey, 2009 and 2011[a]

	Female (n = 2084)		Male (n = 474)	
Characteristic	**Adjusted % (95% CI)[b]**	***P* Value**	**Adjusted % (95% CI)[b]**	***P* Value**
Total	54.0 (50.5–57.4)		35.1 (30.4–40.1)	
Year				
2009	52.2 (48.2–56.2)	.18	35.0 (29.5–41.0)	.97
2011	56.6 (51.2–61.8)		35.2 (28.8–42.2)	
Age, y				
≤14	49.2 (39.9–58.5)	.001	38.9 (21.9–59.1)	.65
15	49.1 (43.3–54.8)		37.2 (27.5–47.9)	
16	48.4 (43.7–53.1)		35.6 (25.2–47.6)	
17	58.3 (53.9–62.5)[c]		38.5 (28.2–49.9)	
≥18	60.9 (54.6–66.9)[c]		29.3 (21.3–38.8)	
Race/ethnicity				
Non-Hispanic white	56.2 (52.6–59.7)[d]	<.001	34.9 (29.3–41.0)	.19
Non-Hispanic black	22.6 (9.7–44.5)		23.5 (13.3–38.1)	
Hispanic	35.8 (29.6–42.6)		34.2 (23.9–46.4)	
Non-Hispanic other	42.5 (30.7–55.3)		48.0 (32.4–64.0)	
US census region				
Northeast	51.6 (46.4–56.8)	.05	37.6 (26.4–50.4)	.77
Midwest	52.8 (47.0–58.5)		32.6 (26.4–39.5)	
South	59.4 (54.2–64.4)[e]		36.6 (29.6–44.1)	
West	45.1 (33.9–56.8)		36.3 (25.4–48.8)	
Routine sunscreen use[f]				
Yes	43.5 (34.4–53.0)	.01	40.8 (23.8–60.3)	.51
No	55.0 (51.6–58.2)		34.6 (30.0–39.6)	
Ever smoked cigarettes daily[g]				

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Characteristic	Female (n = 2084)		Male (n = 474)	
	Adjusted % (95% CI)[b]	*P* Value	Adjusted % (95% CI)[b]	*P* Value
Yes	53.0 (45.5–60.4)	.77	43.8 (31.4–57.0)	.12
No	54.2 (50.6–57.7)		31.5 (25.3–38.6)	
Binge drinking[h]				
Yes	61.0 (57.1–64.9)	<.001	36.6 (31.0–42.6)	.61
No	48.7 (44.3–53.1)		33.5 (24.9–43.4)	
Ever used illegal drugs[i]				
Yes	51.8 (47.0–56.5)	.14	32.8 (26.9–39.3)	.31
No	56.5 (52.1–60.8)		39.8 (29.7–50.8)	
Ever took steroids without a physician's prescription[j]				
Yes	65.5 (53.8–75.7)	.04	40.7 (28.6–54.1)	.31
No	53.5 (50.0–56.9)		34.1 (29.2–39.4)	
Ate fruit and vegetables ≥5 times/d[k]				
Yes	53.4 (47.4–59.2)	.82	41.1 (33.1–49.5)	.11
No	54.1 (50.4–57.7)		32.3 (26.4–38.9)	
Unhealthy weight control practices[l]				
Yes	53.7 (47.6–59.7)	.92	38.8 (29.5–48.9)	.40
No	54.1 (50.3–57.5)		33.9 (28.4–39.9)	
Ever had sexual intercourse				
Yes	57.9 (54.3–61.5)	.001	33.7 (27.8–40.2)	.35
No	46.3 (39.8–52.9)		39.3 (30.9–48.4)	
Had sexual intercourse with ≥4 persons during their life				
Yes	55.3 (48.6–61.8)	.64	50.1 (38.1–62.0)	.002
No	53.6 (50.0–57.3)		28.0 (23.1–33.5)	
Attempted suicide[m]				
Yes	47.5 (39.1–56.0)	.12	52.4 (35.6–68.6)	.03
No	54.5 (51.0–58.1)		32.6 (27.4–38.3)	

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Characteristic	Female (n = 2084)		Male (n = 474)	
	Adjusted % (95% CI)[b]	*P* Value	Adjusted % (95% CI)[b]	*P* Value
Played on ≥1 sports team[n]				
Yes	55.9 (51.7–60.1)	.06	34.1 (28.2–40.5)	.54
No	50.9 (46.7–55.1)		37.4 (29.4–46.2)	

[a] Frequent indoor tanning was defined as using an indoor tanning device (eg, a sunlamp, sunbed, or tanning booth) 10 or more times during the 12 months before the survey among those engaging in indoor tanning in the past 12 months; it did not include getting a spray-on tan. Estimates were based on weighted data. Because of missing data, the sample size for each logistic regression analysis varies.

[b] Predictive margins calculated from a multivariable logistic regression model including all covariates shown. *P* value is based on a global adjusted Wald *F* test for association between each of the variables and the outcome, controlling for all other variables in the logistic regression model.

[c] $P < .05$ compared with age 16 years, age 15 years, and age 14 years or younger, assessed with general linear contrast.

[d] $P < .05$ compared with all other race/ethnicity groups, assessed with general linear contrast.

[e] $P < .05$ compared with the West and Northeast, assessed with general linear contrast.

[f] Most of the time or always wore sunscreen with a sun protection factor of 15 or higher when outside for 1 hour or more on a sunny day.

[g] Ever smoked 1 or more cigarettes every day for 30 days.

[h] Had 5 or more drinks of alcohol in a row within a couple of hours on 1 or more days during the 30 days before the survey.

[i] Used marijuana, cocaine, heroin, methamphetamines, ecstasy, or injected any illegal drug with a needle 1 or more times during their life.

[j] Took steroid pills or injections without a physician's prescription 1 or more times during their life.

[k] Consumed 100% fruit juice, fruit, green salad, potatoes (excluding French fries, fried potatoes, or potato chips), carrots, or other vegetables during the 7 days before the survey.

[l] Took diet pills, powders, or liquids; vomited or took laxatives; or did not eat for 24 hours or more to lose weight or keep from gaining weight during the 30 days before the survey.

[m] Attempted 1 or more times during the 12 months before the survey.

[n] Sport was run by their school or community groups during the 12 months before the survey.